One Size Fits All? Race, Gender and Body Mass Index among U.S. Adults

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This study examined the extent to which factors presumed to be correlated with body mass index (BMI) vary across four race- and gender-specific groups. Data were drawn from the American Changing Lives Survey to estimate separate multivariate regression models for the total study sample that included African-American males, Caucasian males, African-American females and Caucasian females. The dependant variable of interest was BMI. Independent variables included age, human capital variables, relationship and support measures, health status and behavior measures, and stress and outlook measures. Results from the pooled model indicated that BMI was associated with a number of factors such as employment status, chronic illness, financial strain and religiosity. However, race- and gender-specific regression models revealed that predictors of BMI varied considerably for African-American men, Caucasian men, African-American women and Caucasian women. In other words, these models disentangled important correlations not observed in the pooled model. These findings suggest that addressing racial disparities in body weight-related outcomes requires health practitioners to modify obesity prevention and treatment efforts to incorporate a broader array of factors inherent to specific racial and gender populations.

Key words: race ■ health disparities ■ obesity ■ body mass index

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INTRODUCTION

African Americans are more likely to be obese and to be debilitated by illnesses associated with obesity.[1,2] Race is an important factor in obesity prevalence studies.[2,3] However, few studies provide insight into the factors that impact obesity, specifically among African Americans. The studies that do tend to focus on socioeconomic status (SES) at the individual or community level. The working assumption in such studies is that racial differences in obesity are a function of economic resources. African Americans tend to have lower SES than Caucasians and have the propensity to live in communities that are disadvantaged in a number of ways.[2,4-6] Poor individuals and communities lack the resources necessary to develop and maintain healthy eating and exercise habits. Deeply entrenched patterns of disinvestment have left poorer communities without exercise facilities and grocery stores that could help residents prioritize, integrate and maintain higher levels of physical activity and healthier eating habits into their lifestyles.[4,7,8] Furthermore, Robert and Reither[2] argue that disadvantaged communities can affect the psychological and normative functioning of their residents. For example, overeating or eating unhealthy "comfort food" has been described as a response to chronic stressors (i.e., crime, despair, discrimination) that marginalized groups face on a regular basis. Long-term exposure to these stressors and unhealthy coping mechanisms can lead to the development of less-discriminating attitudes about weight gain, thereby decreasing the likelihood of weight loss and healthy weight management. The findings from this line of research have shown economic disadvantages to be only partially responsible for racial disparities in obesity which suggests that other factors link racial group membership to unhealthy weight status.

Gender also emerges as an important factor in understanding the relationship between race and weight status because African-American women as a group have a higher prevalence of obesity and a greater risk for weight management problems than all other race- and gender-specific populations.[1,9] Researchers have postulated that the link between race or gender and unhealthy body weight can be attributed to culture, genetic, environmental and behavioral factors. For example, it has been suggested that low-income African-American women use food as a means to cope with the disadvantages of belonging to three marginalized groups (female, African Americans, the poor),[10] yet research has not provided any evidence to date to support this notion. Most of the existing research tends to estimate statistical models in which race and gender are represented by dichotomous variables (African American=1; female=1), making it difficult to assess whether factors associated with obesity and other body weight-related measures vary in race- and/or gender-specific ways. Consequently, very little is known about, perhaps, the more relevant factors influencing weight outcomes among African-American women and African-American men.[11]

We believe that a better understanding of the determinants of racial disparities in body weight outcomes will emerge with a study assessing the degree to which nonbiomedical factors associated with body mass index (BMI) vary by race and gender. To this end, we use data from the American Changing Lives Survey (ACLS), a nationally representative sample of U.S. adults in 1986, to estimate and compare race- and gender-specific models of BMI. The ACLS is one of the few nationally representative samples that allow us to consider factors that are not typically found in recent studies specifying the correlates of body weight or weight status. The older yet relatively untapped data source allows us to conduct a more intricate investigation of factors that influence body weight beyond diet and exercise.

Healthy People 2010 is in part an effort to eliminate health disparities among segments of the population, including differences that occur by gender, race or ethnicity, education or income, disability, geographic location, or sexual orientation.[12] Overweight status has been identified as one of the 28 key focus areas that needs to be addressed in order to realize this goal. Our analyses make three primary contributions to this effort. First, they focus on a key area of importance to *Healthy People 2010*—overweight status. Secondly, they explore the extent to which being African American or Caucasian and male or female interact to impact weight status, distinctions that are clearly stated in *Healthy People 2010* goals as being critical in efforts to systematically eliminate health disparities. Thirdly, the results from the study provide some evidence of the complexity associated with addressing racial disparities in body weight-related outcomes which may require health practitioners to modify obesity prevention and intervention efforts to incorporate social and psychosocial factors associated with health outcomes in race- and gender-specific populations.

Methods

The data analyzed here were drawn from the ACLS conducted by the Survey Research Center of the University of Michigan in 1986.[13] Respondents were chosen from a stratified, multistage, area probability sample of noninstitutionalized residents of the coterminous United States who were ≥25 years of age. African Americans and individuals aged ≥60 were sampled at twice the rate of their respective counterparts. Data from wave 1 were used because these data were free from the problems of subsequent waves such as respondent attrition and limited variable selection. The analytic data were drawn from 3,617 in-home, face-to-face interviews. The total numbers of Latino (70) and Asian (50) respondents were too small for adequate representation in the sample and were excluded from the analysis. As such, the sample size for this study was 3,497. African Americans and women made up 34–63%, respectively, of the total number of respondents.

Outcome Measure

The primary outcome variable is BMI. BMI is a measure derived by dividing the self-reported weight (in pounds) by self-reported height (in inches squared) and multiplying the dividend by 703.

Human Capital Measures

Age, income and education are considered to be important factors impacting BMI. These indicators tend to have nonlinear relationships with health indices; therefore, each of these variables was modified in some way. Age was represented in the model by age and age-squared. Income and education were represented by a series of dummy variables. Income categories (in 1986 U.S. dollars) were: 1) poor ($0–$9,999), 2) middle-class ($10,000–$39,999) or 3) affluent (≥$40,000). The poor category was the excluded category. Education categories were: 1) 0–11 years of education, 2) high-school graduate (12 years), 3) attended college (13–15 years of education), or 4) college graduate (≥16 years of education). The excluded category was 0–11 years.

Relationship and Support Measures

Social relationships and support were measured by variables hypothesized to be correlated with being overweight or obese. Marital status and the respondent's total number of children were the relationship variables. Social support was represented by informal social integration and friendship/relative support. Informal social integration was represented in this analysis by a dummy variable corresponding to the frequency (or occasional frequency) that respondents talk on the phone or visit with acquaintances, friends or relatives. "Never" was the reference category. Friendship and relative support was captured by a variable accounting for the number of persons with whom respondents felt they could "really share her/his very private feelings and concerns."

Health Status and Health Behavior Measures

Health status was represented in the model by two variables. The first was a physical health index comprised of the arithmetic mean of responses to items asking about activities such as yard work, sports participation and exercise. The second health status measure was a chronic illness index totaling the number of chronic physical problems (e.g., arthritis, rheumatism, lung disease, stroke, hypertension, heart trouble, diabetes, cancer, fractured bones and bladder control). Health behavior was represented in this analysis by tobacco use, a categorical variable indicating whether the respondent was a current smoker (coded 1) or not.

Stress and Outlook Measures

Stress and one's general outlook on life have been hypothesized to impact BMI in recent studies.[2,14] Our model contains standardized measures that account for religious participation, financial stress and depression. The religious participation variable was an index comprised of the arithmetic mean items measuring the frequency that respondents attended religious services, read religious books or religious materials, and watched or listened to religious programming. Chronic financial stress was the respondent's self-assessment of the challenges associated with their respective family's financial situation. Depression was represented in the study by a depression symptoms index that is the arithmetic average of responses to 11 items asking about mood.

Analytic Strategy

The objective of this study was to determine the extent to which the factors associated with BMI vary by race and gender. We pursued this objective through descriptive and regression analysis. Table 1 presents group-specific descriptive statistics that demonstrated how African-American males, African-American females, Caucasian males and Caucasian females varied across key indicators. Table 2 presents results from five ordinary least squares regression models that allowed us to determine the degree to which the subgroup models differed from a pooled model and each other. Table 3 presents a general summary of significant regression results. All analyses were performed using Stata®/SE version 9.

RESULTS

The descriptive results in Table 1 indicate that African Americans had fewer resources than their Caucasian counterparts. African-American males and females had large segments of their respective subpopulations represented in the poorest and least-educated categories.

Table 1. Descriptive characteristics of the sample population by race and gender

	African-American Males	Caucasian Males	African-American Females	Caucasian Females
Obese (BMI >30)	15.91%	13.89%	30.08%	15.11%
BMI[1]	26.17 (4.43)	26.02 (4.17)	27.87 (6.18)	25.15 (4.88)
Age[1]	51.90 (16.84)	51.50 (17.69)	52.95 (17.58)	56.60 (17.41)
Income				
<$9,999	34.59%	16.21%	57.32%	28.68%
$10,000–$39,999	50.51%	58.54%	36.38%	55.08%
≥$40,000	14.90%	25.25%	6.30%	16.24%
Employed (0=unemployed)	64.39%	66.15%	43.96%	42.37%
Education				
<12 years	51.01%	28.00%	51.54%	31.43%
High-school diploma	19.95%	28.45%	26.22%	34.32%
13–15 years of school	20.45%	21.06%	15.04%	21.26%
> College degree	8.59%	22.49%	7.20%	12.99%
Married	45.45%	30.43%	68.51%	42.58%
Have Children	38.89%	38.48%	54.76%	35.88%
Visits w/Friends				
Never	18.19%	9.92%	11.05%	5.58%
Occasional	37.37%	34.18%	34.58%	24.01%
Frequent	44.44%	55.90%	54.37%	70.41%
# Friends Can Share Feelings[1]	2.09 (1.80)	2.27 (1.92)	1.96 (1.61)	2.34 (1.75)
Physical Activity[1]	-0.225 (1.02)	0.115 (0.984)	-0.504 (1.05)	-0.209 (1.08)
Chronic Illness[1]	1.35 (1.41)	1.01 (1.26)	1.73 (1.48)	1.50 (1.41)
Tobacco Use (0=no)	42.17%	29.44%	28.15%	26.06%
Financial Stress[1]	0.316 (1.04)	-0.148 (0.960)	0.588 (1.11)	-0.103 (1.02)
Depression[1]	0.154 (1.07)	-0.128 (0.932)	0.443 (1.13)	0.046 (1.03)
Religious Participation[1]	-0.390 (0.917)	0.187 (0.978)	-0.818 (0.832)	-0.142 (0.968)
N	396	907	778	1,416

1: Table entries are means (standard deviations are in parentheses)

These results also demonstrate how African-American females stood out in two ways. First, the proportion of African-American females (30.08%) classified as clinically obese (BMI ≥30) more than doubled the portion of obese Caucasian males (13.89%) and nearly doubled the corresponding proportions of African-American males (15.91%) and Caucasian females (15.11%), respectively. Second, the descriptive statistics also suggest that higher mean levels of chronic illness, financial stress and depression were experienced by African-American females. These findings suggest that race and gender can interact to amplify disadvantages or potential health risks.

Table 2 reports the relationships between the independent variables and BMI for the pooled sample and for race- and gender-specific subgroups. Most of the human capital variables were found to have statistically significant relationships with BMI in the pooled model. Respondents who were employed or had <12 years of education had higher BMI than their unemployed or more educated counterparts, respectively, all else being equal. The negative age coefficient in the pooled results indicated that BMI decreased with age. The pooled results also suggested that race and gender were correlated with BMI, but the significant interaction term indicated that their respective relationships with BMI were conditioned upon each other. Specifically, the association between race and BMI is different for males and females. The alternative interpretation is that the relationship between gender and BMI depends upon whether the respondent is African American or Caucasian. Either interpretation suggests the need to control for race and gender simultaneously to assess whether the factors associated with BMI vary across race- and gender-specific subgroups.

The results in Table 2 indicate that the relationship between the human capital measures and BMI changed considerably in the analyses of race- and gender-specific subsamples. The age coefficient was not statistically significant in any subgroup models, indicating that aging was not linked to the BMI for any of the subgroups in this analysis. The relationship between income and BMI was not statistically significant in the pooled model; however, the subgroup analyses suggested that income was relevant for one group, African-American males. Middle-class Af-

Table 2. Association of BMI and social, economic and health indicators by race and gender in the ACL survey

	Total Sample	African-American Males	Caucasian Males	African-American Females	Caucasian Females
Race	-0.407 (0.300)				
Sex	-0.1.22(0.213)***				
Race * Sex	2.44 (0.362)***				
Age	-0.023 (0.007)**	0.009 (0.021)	-0.014 (0.012)	-0.064 (0.019)	-0.014 (0.012)
Age2	0.373 (0.117)**	0.079 (0.274)	0.243 (0.205)	0.343 (0.288)	0.503 (0.188)**
Income					
$10,000–$39,999	0.339 (0.226)	1.54 (0.583)**	0.501 (0.432)	0.011 (0.544)	0.247 (0.347)
≥$40,000	0.233 (0.332)	1.38 (0.863)	0.789 (0.545)	-0.277 (1.11)	-0.376 (0.510)
Employed (0=unemployed)	0.655 (0.208)**	0.728 (0.616)	1.03 (0.399)**	0.775 (0.507)	0.261 (0.311)
Education: (0=<12 years)					
High-school diploma	-0.940 (0.222)***	-0.546 (0.634)	-0.512 (0.392)	-1.44 (0.557)**	-0.935 (0.338)**
13–15 years of school	-1.28 (0.257)***	-0.587 (0.645)	-0.957 (0.435)*	-2.04 (0.723)**	-1.24 (0.390)***
> College degree	-1.28 (0.303)***	-0.914 (0.934)	-1.08 (0.455)*	-1.52 (0.954)	-1.39 (0.468)**
Married	-0.592 (0.189)**	0.427 (0.545)	-0.125 (0.336)	-1.23 (0.504)*	-0.719 (0.290)*
Have Children	0.364 (0.194)	1.42 (0.543)**	0.650 (0.323)*	-0.184 (0.503)	0.201 (0.313)
Visits w/Friends (0=never)					
Occasional	0.267 (0.306)	1.01 (0.624)	1.41 (0.493)**	-0.427 (0.732)	-1.35 (0.587)*
Frequent	0.563 (0.296)	0.483 (0.614)	1.48 (0.490)**	0.377 (0.714)	-0.866 (0.559)
# Friends Can Share Feelings	-0.102 (0.047)*	-0.192 (0.122)	-0.139 (0.072)*	-0.121 (0.134)	-0.001 (0.073)
Physical Activity	-0.340 (0.084)***	0.108 (0.237)	-0.459 (0.148)**	-0.458 (0.217)*	-0.316 (0.126)*
Chronic Illness	0.833 (0.072)***	0.473 (0.201)*	0.662 (0.128)***	1.17 (0.186)***	0.824 (0.107)***
Tobacco use (0=no)	-1.12 (0.188)***	-0.932 (0.449)*	-1.03 (0.369)***	-1.19 (0.501)*	-1.17 (0.297)***
Financial Stress	0.235 (0.091)**	-0.343 (0.242)	0.137 (0.165)	0.540 (0.217)*	0.350 (0.145)*
Depression	-0.263 (0.087)**	-0.169 (0.223)	-0.324 (0.164)*	-0.326 (0.209)	-0.261 (0.134)
Religious Participation	0.068 (0.020)***	0.061 (0.055)	0.057 (0.032)	0.199 (0.060)***	0.014 (0.031)
Constant	24.92***	21.99***	23.35***	27.64***	24.87***
N	3497	396	907	778	1416
R^2	0.12	0.07	0.07	0.12	0.10

Table entries are unstandardized coefficients. (Standard errors in parentheses); * p<0.05, ** p<0.01, *** p<0.001

rican-American men were found to have higher BMI than poor African-American men, all else being equal. The findings for employment and education indicate that the pooled sample results masked important subgroup variation. Employment was significant in the pooled results; however, the positive association between this factor and BMI was limited to Caucasian males. The education results present similar, albeit more complex, findings. Caucasian females and African-American females to a lesser degree had findings that mirrored the pooled sample results. The relationship between education and BMI was at the other end of the spectrum for African-American males. Education did not have a statistically significant correlation with BMI for this group.

The relationship and support variables were found to be correlated with BMI. However, the patterns of association in the pooled samples differed somewhat from those in the subgroup models. Individuals who had children and visited frequently with friends had higher BMI, on average, than pooled sample members who had no children and who never visited with friends. The pooled sample results also showed that being married (versus being single) and having a number of friends with whom feelings can be shared was negatively correlated with BMI. These patterns did not hold in the subgroup analyses. The subgroup models in Table 2 reveal that the relationships between being married or having children and BMI varied in gender-specific ways. Married women were found to have lower BMI on average than unmarried women. On the other hand, males who had children were found to have higher BMI than men who did not, all else being equal.

The results associated with the support variables indicate that social support was particularly relevant for Caucasian males, somewhat relevant for Caucasian females and not relevant for African-American males or females. Caucasian males were the only group for which the number of friends with whom they may share feelings was statistically significant. For this group, an increase in the number of people with whom they can share feelings was associated with a decrease in BMI. Socializing was found to be particularly relevant for Caucasian men because those who visited occasionally and frequently with friends had higher BMI than Caucasian males who never visited with friends. Socializing appeared to have a different relationship for BMI of the Caucasian female. First, socializing appeared to have moderate importance for Caucasian women because only one of the variables was significant. Perhaps more importantly, the correlation between visiting with friends and BMI was negative. Caucasian women who had occasional visits with friends had lower BMI on average than their counterparts who never visited with friends.

Three of the four health-related factors were found to have statistically significant relationships with BMI in the pooled analysis. Physical activity and tobacco use had an inverse association with BMI, while chronic illness had a positive relationship with BMI. Increased levels of physical activity and smoking were shown to control or reduce weight gain. In contrast, the pooled results show that chronic illness was linked with weight gain. The relationships between chronic illness or tobacco use and BMI held across all groups. However, patterns for physical activity did not. African-American males stand out as the only group for which the level of physical activity was not statistically significant, suggesting that this variable had little or no relevance for their BMI.

Finally, financial stress, depression and religious participation were also found to have statistically significant relationships with BMI in the pooled sample. The results show that financial stress and religious participation had a positive correlation with BMI. The pooled results also suggest that depression had an inverse relationship with BMI. This correlation coincides with the widely accepted notion asserting changes in weight to be a symptom of depression. The subgroup analyses indicate that the relationship between financial stress and BMI becomes increasingly complex with race and gender considerations. Financial stress appeared to be only relevant for women. The subgroup analysis results indicate that an increase in stress levels was correlated with an increase in BMI for both African-American and Caucasian women. The subgroup results associated with depression show that the BMI of Caucasian males was positively correlated with depression. Religious participation was found to be associated with the BMI of African-American women. The positive coefficient suggested that religiosity was correlated with higher BMI among this group.

DISCUSSION

The research literature acknowledges that race and gender are key factors associated with BMI and other body weight-related outcomes.[2,9,11,15] This acknowledgement is often conveyed through models that resemble the pooled model in Table 2. In a manner consistent with existing research, the pooled results demonstrate that African Americans and women had higher mean BMI levels than Caucasians and men, respectively. However, these findings do little to inform us about how racial and/or gender group membership is associated with BMI. Our race- *and* gender-specific analyses provide a glimpse into how a number of independent variables were related to BMI among four subgroups. Such analyses represent an important step toward the development of health outcome models that reflect dynamics associated with being African American or Caucasian as well as male or female in a race- and gender-stratified society.

The pooled results suggest that BMI was correlated with a number of factors. Employment status, parental status, frequent visits with friends, chronic illness, financial stress and religious participation are all positively correlated with BMI. The pooled results also indicate that age, education, marital status, the number of friends with whom one can share feelings, levels of physical activity, tobacco use and depression have a negative association with BMI. These results were consistent with other studies specifying the correlates associated with weight-related outcomes.[1-3,9,15] However, the relationship between these factors and BMI were independent of race and gender in the pooled analysis. The picture changes considerably once race and gender group membership becomes a central focus. Our analyses indicate that BMI models for African-American men, African-American women, Caucasian men and Caucasian women vary considerably.

Chronic illness was found to have a significant relationship with BMI that extends across all of the models in Table 2. The positive relationship between chronic illness and BMI was congruent with the wealth of research literature demonstrating the correlation between body weight and the risk for major chronic conditions such as diabetes, hypertension and coronary heart disease.[3,15-17] While this relationship was not surprising, it is noteworthy because chronic illness was the only variable having a universal relationship with BMI.

Each subgroup had a unique set of factors correlated with BMI. The results indicate that the BMI model of Caucasian men bears some resemblance to the pooled model. Multiple human capital (employment status, education beyond high school), relationship (parental status, occasional and frequent visits with friends, the number of friends with whom they could share feelings), health status (physical activity, tobacco use), and stress and religiosity (depression, religious participation) variables had a statistically significant association with the BMI of Caucasian men. The model for Caucasian women was less robust; however, BMI among Caucasian women was also associated with a number of factors, including education beyond the 11th grade, marital status, occasionally visiting with friends, physical activity, smoking and financial stress. Among African-American women, 12–15 years of schooling, marital status, physical activity, tobacco use, financial stress and religious participation were significantly related to BMI. African-American men stood out because of the limited number of factors that were found to have statistically relevant relationships with BMI. Middle-class status and having children were the only factors besides chronic illness to be significantly correlated with BMI among African-American men.

This study is significant because it highlights the po-

Table 3. Pooled and subpopulation regression models of BMI: summary of significant results

	Total Sample	African-American Males	Caucasian Males	African-American Females	Caucasian Females
Race					
Sex	-0.1.22(0.213)***				
Race * Sex	2.44 (0.362)***				
Age	-0.023 (0.007)**				
Age2	0.373 (0.117)**				0.503 (0.188)**
Income					
$10,000–$39,999		1.54 (0.583)**			
≥$40,000					
Employed (0=unemployed)	0.655 (0.208)**		1.03 (0.399)**		
Education (0=<12 years)					
High-school diploma	-0.940 (0.222)***			-1.44 (0.557)**	-0.935 (0.338)**
13–15 years of school	-1.28 (0.257)***		-0.957 (0.435)*	-2.04 (0.723)**	-1.24 (0.390)***
> College degree	-1.28 (0.303)***		-1.08 (0.455)*		-1.39 (0.468)**
Married	-0.592 (0.189)**		-0.125 (0.336)	-1.23 (0.504)*	-0.719 (0.290)*
Have Children		1.42 (0.543)**	0.650 (0.323)*		
Visits w/Friends (0=never)					
Occasional			1.41 (0.493)**		-1.35 (0.587)*
Frequent			1.48 (0.490)**		
# Friends Can Share Feelings	-0.102 (0.047)*		-0.139 (0.072)*		
Physical Activity	-0.340 (0.084)***		-0.459 (0.148)**	-0.458 (0.217)*	-0.316 (0.126)*
Chronic Illness	0.833 (0.072)***	0.473 (0.201)*	0.662 (0.128)***	1.17 (0.186)***	0.824 (0.107)***
Tobacco use (0=no)	-1.12 (0.188)***	-0.932 (0.449)*	-1.03 (0.369)***	-1.19 (0.501)*	-1.17 (0.297)***
Financial Stress	0.235 (0.091)**			0.540 (0.217)*	0.350 (0.145)*
Depression	-0.263 (0.087)**		-0.324 (0.164)*		
Religious Participation	0.068 (0.020)***			0.199 (0.060)***	
Constant	24.92***	21.99***	23.35***	27.64***	24.87***
N	3497	396	907	778	1416
R^2	0.12	0.07	0.07	0.12	0.10

Table entries are unstandardized coefficients. (Standard errors in parentheses); * p<0.05, ** p<0.01, *** p<0.001

tential implications that race and gender can have for health outcomes such as, in this case, BMI. The tendency of previous research to treat race and gender as control or confounding variables fails to fully appreciate that these social constructs inevitably affect the availability of social, economic and political resources impacting health. Furthermore, Caucasians were usually more heavily represented in survey samples; therefore, results tend to reflect the configuration of factors associated with the BMI among this group. Our subgroup analyses revealed patterns of relationships masked in the pooled results. As such, one can conclude that race- and gender-specific models of outcomes such as BMI can lead to a more nuanced understanding of race and gender differences in health and health status.

This research contributes to our understanding of the relationship between race, gender and BMI. However, there are some limitations worth noting. First, BMI was estimated from self-report data. The analysis assumes that reporting errors are distributed equally across groups. However, collecting height and weight using standardized equipment would eliminate any potential reporting bias. Second, the models were estimated using data gathered at the individual level of analysis. Social scientists note that race has implications for the communities in which marginalized groups live as opposed to the individuals themselves. Therefore, it may be fruitful to consider community level factors (e.g., neighborhood SES, crime, economic disinvestment) that discourage or hinder underserved populations from engaging in activities (e.g., exercise, healthy eating) that help them to reach and maintain a healthy body weight. A third limitation worth noting is that the models did not include behavioral factors known to be more proximal to BMI outcomes. Including nutrition factors such as caloric intake, fast or process food consumption and more specific physical activity variables (i.e., average step count, number of days with strenuous exercise, participation in various household activities) could produce models that would yield more significant results.

It is also noteworthy that some might consider the age of the data to be a limitation. However, research has shown that racial distinctions in many of the variables used in the analysis persist across time. The analytic data were collected before the obesity epidemic and the focus on health disparities over the past decade; therefore, one could conclude that the race and gender variations previously discussed are conservative.

CONCLUSION

This study provides a glimpse into the complex relationship among race, gender and health outcomes, specifically BMI. Our results clearly showed that race and gender were correlated with BMI. However, subgroup analyses indicated that racial and gender group membership can have implications for the relationship between other known correlates of BMI.

Our findings lay the foundation for future research because they encourage investigators to think more about group-specific processes associated with BMI and other health-related outcomes. Altering the focus of research in this manner requires scientists engaged in health disparities research to learn more about at-risk populations. To do so would go a long way toward the estimation of robust empirical models that inform us about the factors associated with BMI among African-American men, for example.

It is also noteworthy that results from this line of work could be fruitful for health practitioners and policy makers. Identifying group-specific factors associated with weight gain or weight loss would enable healthcare providers and officials to develop culturally and context-specific programs and interventions to help at-risk individuals manage the barriers to healthy eating and increased physical activity in the short term and eliminate them completely in the long term.

REFERENCES

1. Flegal KM, Carroll MD, Ogden CL, et al. Prevalence and trends in obesity among US adults, 1999–2000 [see comment]. *JAMA*. 2002;288:1723-1727.

2. Robert SA, Reither EN. A multilevel analysis of race, community disadvantage, and body mass index among adults in the US. *Soc Sci Med*. 2004;59:2421-2434.

3. Harrell JS, Gore SV. Cardiovascular risk factors and socioeconomic status in African American and Caucasian women. *Res Nurs Health*. 1998;21:285-295.

4. Massey DS. Segregation and stratification. *Du Bois Rev*. 2004;1:7-25.

5. Sims M, Sims T, Bruce MA. Urban poverty and infant mortality disparities. *J Natl Med Assoc*. 2007;99:349-356.

6. Williams D, Yu Y, Jackson J, et al. Racial differences in physical and mental health: socioeconomic status, stress, and discrimination. *J Health Psychol*. 1997;2:335-351.

7. Ross CE. Walking, exercising, and smoking: does neighborhood matter. *Soc Sci Med*. 2000;5:265-274.

8. Ross CE, Mirowsky J. Neighborhood disadvantage, disorder, and health. *J Health Soc Behav*. 2001;42:58-76.

9. Zhang Q, Wang Y. Socioeconomic inequality of obesity in the United States: do gender, age, and ethnicity matter? *Soc Sci Med*. 2004;58:1171-1180.

10. Lovejoy M. Disturbances in the social body: differences in body image and eating problems among African American and White women. *Gend Soc*. 2001;15:239-261.

11. Davis EM, Rovi S, Johnson MS. Mental health, family function and obesity in African-American women. *J Natl Med Assoc*. 2005;97 478-482.

12. Healthy People 2010: Understanding and Improving Health. Washington, DC: U.S. Government Printing Office; 2000. U.S. Department of Health and Human Services.

13. House JS. American's Changing Lives: Wave I. Ann Arbor, MI: University of Michigan Survey Research Center; 1989.

14. Lee RE, Harris KJ, Catley D, et al. Factors associated with BMI, weight perceptions and trying to lose weight in African-American smokers. *J Natl Med Assoc*. 2005;97:53-61.

15. Cossrow N, Falkner B. Race/ethnic issues in obesity and obesity-related comorbidities. *J Clin Endocrinol Metab*. 2004;89:2590-2594.

16. Diaz VA, Mainous AG, Koopman RJ, et al. Undiagnosed obesity: implications for undiagnosed hypertension, diabetes, and hypercholesterolemia. *Fam Med*. 2004;36:639-644.

17. Montague MC, Broadnax PA. Health consequences of excess weight and obesity. *J Natl Black Nurses Assoc*. 2004;15:24-31. ■